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1954 FLOODS OF CHINA

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1954 FLOODS IN CHINA

Late in the afternoon of August 18 of this year, flood waters piled up before Hankow, higher than they had been during the last 100 years of floods in China. On that day, a record height of 97.6 feet was announced by the anti-flood command at Hankow, 4.6 feet higher than the disastrous 1931 flood, which inundated about 39,000 square miles of highly productive farm land around Hankow and elsewhere along the Yangtze and Huai Rivers.\* Along the Yangtze River, a greater area was flooded than in 1931, but the extent of this year's floods in the Huai River basin was not so great, in part because of extensive flood-control measures carried out by the Communists. Floods along the Huai are estimated to be only 52 percent as severe as in 1931. Highlights of the 1954 flood situation include the protection of the central area of Hankow and possibly some of the rich rice land east of it at the expense of the low-lying areas surrounding Tung-ting Lake and P'o-yang Lake, and the protection of northern Kiangsu and much of the farm land to the north of the Huai River by last-minute dike reinforcement and the sacrifice of farm land within detention basins along the Huai.

The maps accompanying this article (WAC 289, 381, 382, 385, 386, 492, 493, 494, 497, and 498) indicate the probable extent of flooding along the Yangtze and Huai Rivers. The delineation of flooded areas is derived from reports in the Chinese Communist press concerning river levels and flooded areas, plotted on large-scale topographic maps and analyzed. A comparison of the 1954 and earlier high water levels of the Yangtze and Huai Rivers is given in the following tables.

\*The area flooded in 1931 has been derived from planimeter measurements of a map entitled Map Prepared from Aerial Surveys Showing Seriously Flooded Areas Along Yangtze River, Huai River and Grand Canal, dated August 1931, which was prepared by the National Flood Relief Commission and published by the Statistical Department of the Inspectorate General of Customs, Shanghai. Although notes on this map state that 34,000 square miles were seriously flooded (exclusive of lakes), this figure is believed to be about 5,000 square miles too small. A more nearly accurate estimate would be 39,000 square miles.

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Table 1

Flood and Mean Water Levels of the Yangtze River (in feet)

<u>Location</u>	<u>Mean Water Level</u>	<u>1931 High Water</u>	<u>1954 High Water</u>
Nanking	18	30	31.6
Wu-hu	22	39	42.2
Ta-t'ung	28	49	53.6
Huai-ning	34	57	61.9
Hu-k'ou	43	65	69.6
Chiu-chiang	45	67	72.4
Ch'i-ch'un	52	79	83.8
Huang-shih-chiang	--	--	86.0
Hankow	63	93	97.6
T'ung-ling	68	98	101.8
Ch'eng-ling-chi	79	109	112.7
Chien-li	90	118	120.0
Sha-shih	119	143	146.5
Chih-chiang	133	166	169.0
I-ch'ang	144	180	182.8

Table 2

Flood Levels of the Huai River (in feet)

<u>Location</u>	<u>Previous Highest Water Level</u>	<u>1954 High Water</u>
Hung-tze Hu	46	56*
Shuang-kou	52	62*
Wu-ho	56	66*
Lin-huai-kuan	59	69*
Pang-fou	62	72.6
Feng-t'ai	74	82*
Cheng-yang-kuan	79	86.6
Jun-ho-chi	85	89*
San-ho-ch'ien	89	92*
Wang-chia-pa	95	96.5

\*Projected from river profiles.

Analysis of 1954 data indicates that, excluding normal lake areas, about 38,400 square miles along the Yangtze River were probably inundated for over a month. An additional 8,500 square miles in the T'ai Hu and Shanghai plains were flooded locally as a result of heavy rains and slow drainage of the low-lying land, but these areas probably were under water less than a month. Because reports of flooding along the Huai River were less specific than those for the Yangtze area, the maps show maximum and minimum estimates of the flooded area, ranging from 5,000 square miles

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to 12,000 square miles. Apparently, flooding along the Yellow River was negligible in 1954. No dike breaks were reported or are believed to have occurred. Flood waters were probably restricted to the two detention basins indicated on the maps. The extent of the areas inundated in six provinces of Central China are listed in Table 3.

Table 3

Extent of Flooding  
(in square miles)

Province	Total Area Under Floodwaters		Areas Normally Under Water (at low water level)	Actual Areas Flooded (excluding normal water areas)
	Yangtze	Huai		
Anhui	7,700	3,600	1,700	9,600
Honan	--	2,600	--	2,600
Hunan	11,000	--	1,200	9,800
Hupei	13,500	--	700	12,800
Kiangsi	4,600	--	1,600	3,000
Kiangsu (excluding T'ai Hu area)	1,600	2,400	700	3,300
Totals	38,400	8,600	5,900	41,100

It is estimated that over 20 million people in six provinces were directly affected by the 1954 floods. The population affected in each of the provinces is given below.

Table 4

Population Directly Affected by Floods, 1954 <sup>a/</sup>

Anhui	5,155,200
Honan	1,804,400
Hunan	4,125,800
Hupei	4,940,800
Kiangsi	795,000
Kiangsu	3,273,600
Total	20,094,800

a. Population living in areas  
flooded for a month or more.

These estimates do not include the population affected indirectly. Not included are people engaged in flood fighting and relief or rehabilitation work; those affected by the loss of food supply or by the disruption of transportation, industrial, or communications facilities; and the

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populations of low-lying areas in the vicinity of T'ai Hu and Shanghai and in Chekiang where agricultural land was flooded for periods of less than a month. An additional 1 million people in Nanking and 600,000 in Hankow were isolated by the flood waters for an extended period. Of the 20 million directly affected, those who survived the flood must have been evacuated and relocated in places of safety, where they would have to be fed and sheltered during the flood period of July, August, and part of September. After the waters recede (probably not until sometime in November), flood refugees will require help in rehabilitating their buildings and sodden and silt-laden farmlands. Famine, the usual consequence of major floods, appears to be inevitable. The extent and severity of the famine will depend largely upon the amount of help the Communist regime will give the flood victims in reconstruction and replanting. The pattern of famine during the coming winter and spring will coincide generally with the pattern of population displacement and crop loss (see Table 5).

Probably the most severe consequence of the 1954 floods was the loss of summer food crops. The following crude arithmetic tabulation shows the square miles of cultivated land flooded and the consequent crop losses of rice, kaoliang, soybeans, and other summer crops in the six provinces most seriously affected by floods.

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Table 5

Cultivated Land Flooded<sup>a/</sup> and Consequent Crop Loss

<u>Province</u>	<u>Crop</u>	<u>Cultivated Land Flooded (square miles)</u>	<u>Food Pro- duction Lost (tons)</u>
Anhui	Rice	2,285	1,376,600
	Kaoliang	595	221,500
	Soybeans	814	234,200
	Other summer crops <sup>b/</sup>	554	217,400
	Total	4,248	2,049,700
Honan	Rice	42	23,000
	Kaoliang	223	84,000
	Soybeans	197	54,000
	Other summer crops <sup>b/</sup>	577	1,289,000
	Total	1,039	1,450,000
Hunan	Rice	5,240	4,313,800
	Kaoliang	65	25,300
	Soybeans	191	69,500
	Other summer crops <sup>b/</sup>	485	457,000
	Total	5,981	4,865,600
Hupei	Rice	3,606	2,304,000
	Kaoliang	325	131,100
	Soybeans	383	128,000
	Other summer crops <sup>b/</sup>	897	624,600
	Total	5,211	3,187,700
Kiangsi	Rice	1,300	915,000
	Kaoliang	negligible	negligible
	Soybeans	156	46,800
	Other summer crops <sup>b/</sup>	235	128,900
	Total	1,691	1,090,700
Kiangsu	Rice	664	518,000
	Kaoliang	131	57,000
	Soybeans	320	119,000
	Other summer crops <sup>b/</sup>	321	184,000
	Total	1,436	878,000
Totals for six provinces:			
	Rice	13,137	9,450,400
	Kaoliang	1,339	518,900
	Soybeans	2,061	651,500
	Other summer crops <sup>b/</sup>	3,069	2,900,900
	Total	19,606	13,521,700

a. Data do not include low-lying areas in the vicinity of T'ai Hu or Shanghai, which were flooded locally.

b. Includes soybeans, corn, millet (two varieties), peanuts, sweet potatoes, and sesame. Even distribution of crops was assumed.

The largest crop loss was in Hunan and included almost half of the rice lost as a result of the floods -- presumably in the surplus rice producing area around Tung-ting Hu. The second largest area of crop loss was in Hupeh, probably in the surplus rice growing area on the floodplain southwest of Hankow. The greatest loss of kaoliang and soybeans, however, was in Anhwei. Least damage to cultivated land was incurred in Honan and Kiangsu, possibly reflecting the relative high degree of success that the Communists had attained in alleviating flooding by the use of detention basins and dike reinforcement.

No attempt has been made in Table 5 to indicate winter food-crop losses or the loss of cotton and tobacco, both of which are important industrial crops in Central China. The loss of winter crops cannot be estimated, since some of them are grown on uplands that were not flooded. Much also depends upon the ability of the Chinese to drain flooded lands and make them ready for the planting of winter crops by October or November. In northern Anhwei and Hupeh, for instance, water levels along the Huai probably dropped sufficiently by September to permit the planting of winter wheat, whereas the planting of winter crops in the area lying north of the middle Yangtze in Anhwei and Hupeh will probably be prevented by the slow runoff of water. In the latter area, continuing high water levels have also probably cancelled out the second rice crop as well as the first. The cotton crop, concentrated in the area southwest of Hankow, was also lost because its normal July-September harvest coincided with the high-water period of the Yangtze.

In its effect on industry in Central China, flooding was probably most serious for the Yung-li Chemical Plant, located on the Yangtze floodplain northeast of Nanking. If the Communists were unable to take adequate preventive measures, water levels were high enough to cause serious water and silt damage to electric motors, generators, and other electrical equipment in the plant. Industrial areas in Shanghai, Nanking, and Hankow were probably adequately protected from floodwaters by diking, as was the iron and steel plant at Ta-yeh. It is likely, however, that the open-pit iron mines at Ta-yeh were flooded and will be out of commission for some time.

The effect of floods on rail transportation is believed to be temporary. There is insufficient information on the condition of roadbeds, track, and way structures to permit assessment of the probable damage from prolonged submersion. Washouts were likely at major stream and river crossings during the heavy rains of June, July, and August.

Despite the extent of damage, the severity of 1954 floods and the pattern of flooding suggest that in some areas the flood-control projects of the Communists were relatively successful in alleviating the effects of the floods. In other places, control projects were as ineffectual as the group of Chinese flood fighters who reportedly stood hand in hand, with straw mats on their backs, trying to hold back the waters in a dike breach.

The Chingchiang detention basin (see WAC 494) above Hankow was designed to provide a safety valve for crests coming down the Yangtze toward Wu-han and the surplus rice producing area of Tung-ting Lake. Although it lowered the estimated crest by 28 inches for 1 day at Sha-shih, the detention basin apparently was quickly filled to its capacity of 176 billion cubic feet. The basin was opened on July 22 and drew off 197,680 cubic feet of water a second. In 2 days, it had impounded over 35 billion cubic feet of water, one-fifth of its capacity. By late July or mid-August, it had been partially drained to prepare for further high waters which, in fact, arrived during the second and third weeks of August.

The Tung-ting Hu area (see WAC 494) also had to be sacrificed in an effort to protect Hankow, since the Chingchiang detention basin proved inadequate. The effort was apparently successful insofar as the central part of the city was concerned. However, by extending protection to Hankow, the "protected areas" of the south Tung-ting Hu Reclamation Project (almost completed last spring) were allowed to be flooded. This project, with about 3,000 acres of reclaimed land and 44,000 acres of producing land, was to be enclosed within a system of dikes, drainage canals, and regulation locks in order to provide much-needed extension of the surplus rice producing region.



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Another area of concentrated flood-control activity is located along the Chingchiang dike opposite the Chingchiang detention basin (see WAC 494). The dike extends from Chiang-ling on the north bank of the Yangtze, past Sha-shih, to a bend of the river known as Ma-pu-kai. Although the purpose of this dike was ostensibly to protect the rich farm land behind it, it is believed that the actual purpose was to relieve flood pressure on dikes to the north and northwest of Hankow. The strengthening of the dike evidently spared the agricultural land behind it from inundation. The dike, however, was not enough to protect Hankow, and low-lying land in the vicinity of Hung Hu and several areas along the Han River were reportedly opened as flood-detention basins.

Anti-flood work from Hankow to Shanghai was limited to the strengthening of weak spots in the dikes and to evacuation and rescue work along the Yangtze from Po-yang Lake to Nanking (see WAC 386, 492, and 493).

Flood-control projects were more numerous in the Huai River Basin than along the Yangtze. These efforts may be responsible for the decline in flooding as compared with 1931. At least four reservoirs and detention basins were in operation in 1954. The height of dikes was also raised 3 feet in stretches along the middle and lower courses of the river. The supplementary outlet for Huai River waters afforded by the North Kiangsu (Su-pe) Main Irrigation Canal via the Kao-laing regulator dam helped prevent the spread of flooding to the irrigated land in northern Kiangsu between the Grand Canal and the sea (see WAC 386).

Probably more efficacious in relieving pressure on the Huai River dikes was the use of detention basins, controlled by newly built regulator dams along the middle course of the river. During the high-water period in mid-August, eight floodplain areas between Cheng-yang-kuan and San-ho-chien were opened and flooded beyond their planned capacities -- the Meng-ho, Cheng-hsi Hu, Cheng-tung Hu, Meng-chia Hu, Chiang-chia Hu, Chiu-chia Hu, Tang-tuo Hu, and Wa-fu Hu detention basins (see WAC 385 and 386). These, together with the Hungtse Hu detention basin and the "Fang-chiu Hu" flood-diversion area in the vicinity of Lin-huai-kuan, stored over 706 billion cubic feet of floodwaters during the high-water period. The flood-detention basins are generally diked, have regulated

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inlets and outlets, and are cultivated in non-flood years. In times of flood, detention-basin farmland is considered expendable and the farming population is evacuated to safe areas. The areas committed to flood detention have been included in the tabulations of flooded areas, cropland flooded, and population affected (Tables 3, 4, and 5).

Three additional flood-detention basins and four reservoirs\* in the upper Huai were reported as filled to capacity. They are the Shih-man-tan, Pan-chiao, Pai-sha, and Po-shan reservoirs and the Lao-wang-po, Chiao-ting Hu, and Tung Hu detention basins (see WAC 385). The middle-course detention basins, together with those on the upper course, and the four reservoirs are believed to have lessened the pressure of floodwaters on dikes along the lower Huai sufficiently to prevent widespread flooding of farmlands north of the Huai in the vicinity of Pang-fou or east of the Grand Canal dike in northern Kiangsu.

It is believed that flooding along the Yellow River was negligible, although the Peking People's Daily reports that "10 crests were tided over on the Yellow River." Presumably the volume of flow was not great enough to set in motion the violent meandering of the river that is the usual cause of dike breaches and flooding along the Yellow River. Considerable attention was also paid to dike maintenance and repair along the river during the high-water period. In addition to these measures, the new Shih-tou-chiang detention basin along the northern bank of the river and the area around Tung-p'ing Hu were opened to relieve the pressure of floodwaters (see WAC 381, 382, 385, and 386). Diking and the use of water-detention basins apparently enabled the Communists to keep the Yellow River in its channel and prevented widespread flood damage of the lowlands to the south.

"Under the principle of subordinating minor interest to major interests and subordinating partial interests to overall interests, the People's government energetically and on its initiative diverted the flood and detained the flood and moved the people of flood detention areas to safety areas beforehand and assisted the calamity stricken people in a planned manner. All this played an important part in defending cities,

\*Up to late spring 1954 the Communist press had reported the completion of only three reservoirs.

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removing dangers to certain cities like Wuhan and protecting agricultural production in vast areas." Thus, an official of the Central Anti-Flood Headquarters in Peking summarizes the basic policy followed in the 1954 fight against the floods. All detention basins and reservoirs available for use were opened in an effort to protect Wuhan, the agricultural area to the southwest of Wuhan, and the critical transportation center of Pang-fou.

The dilemma of the officials responsible for flood control is apparent. On the one hand is the urgent need for more rice land in the fertile Central Yangtze Basin. The South Tung-ting Hu Reclamation Project is but one example of the effort to extend rice production into previously marginal producing areas. On the other hand is the imperative need for flood-detention areas for times of high-water crisis. Tung-ting Hu is little enough for the detention of a normal year's floodwaters; the capacity of the Chiangchiang detention basin is but a drop in the lily pond. To use the same area for flood control and land reclamation is to have their rice cake and eat it, too. Nevertheless, considering the relative success of detention basins and reservoirs along the Huai and the calamitous proportions of the Yangtze flood, it would seem likely that an increase in flood-control activities will be noted during the coming year. These activities may take the form of the construction of more and larger detention basins, or a renewal of interest in a Yangtze gorge dam, or the channelization of the river. But whatever program of flood control is advanced, it will have behind it the impetus of widespread famine, which will certainly follow the 1954 floods.

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